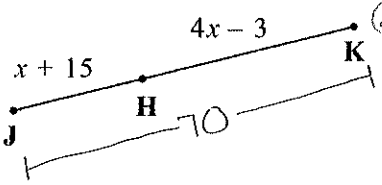
1. Find the length of $\overline{HK}$, given that $\overline{JK} = 70$.



① $JH + HK = JK$

$x + 15 + 4x - 3 = 70$

$5x + 12 = 70$

$-12 \quad -12$

$\frac{5x}{5} = \frac{58}{5}$

$x = \frac{58}{5}$ or 11.6

② Sub. x in HK eqn.

$4(11.6) - 3 = HK$

$43.4 = HK$

2. $\overline{XY}$ has one endpoint located at $X(-13, 12)$ and the other endpoint at $Y\ (2, 4)$. What are the coordinates of the midpoint of XY?

$x_1\ y_1 \qquad x_2\ y_2$

$M\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$ $M\left(\frac{-13+2}{2}, \frac{12+4}{2}\right)$ $M\left(\frac{-11}{2}, 8\right)$ or $M(-5.5, 8)$

3. M is the midpoint of $\overline{AB}$. Find the coordinates of the missing endpoint B if $M(-3, 1)$ and $A(4, -6)$.

x: 4 −7 -3 −7 −10

A M B

y: −6 +7 1 +7 8

$B(-10, 8)$

4. $\overline{DB}$ bisects $\angle ABC$. Find the measure of $\angle ABC$.

↳ 2 ≅ parts $\angle ABD \cong \angle CBD$

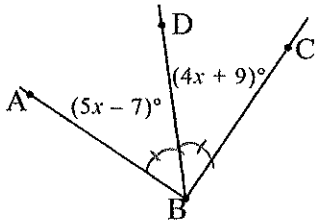
$5x - 7 = 4x + 9$

$-4x \quad -4x$

$x - 7 = 9$

$+7 \quad +7$

$x = 16$



$\angle ABC = 2(\angle ABD)$

$= 2(5(16) - 7)$

$\angle ABD = 146°$

5. Given that $m\angle D = (2x + 30)°$ and $m\angle E = (3x + 40)°$. If $\angle D$ is complementary to $\angle E$, then find $m\angle E$.

① find x

$\angle D + \angle E = 90°$

$2x + 30 + 3x + 40 = 90$

$5x + 70 = 90$

$-70 \quad -70$

$5x = 20$

$x = 4$

② sub x into $\angle E$ eqn. sum of 90°

$\angle E = 3(4) + 40$

$\angle E = 52°$

6. Find the length of PQ if $P(3, -9)$ and $Q(-4, -5)$. Write your answer as a decimal rounded to one decimal place, if needed. Use the distance formula or the Pythagorean Theorem.

Distance formula:

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

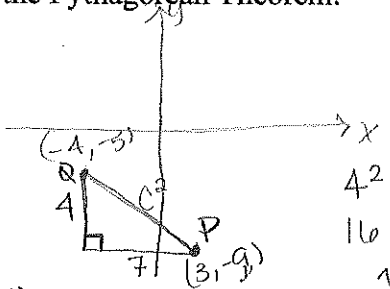
$= \sqrt{(-4 - 3)^2 + (-5 - -9)^2}$

$= \sqrt{(-7)^2 + (4)^2}$

$= \sqrt{49 + 16}$

$= \sqrt{65}$ $d \approx 8.1$

Pythagorean Theorem:

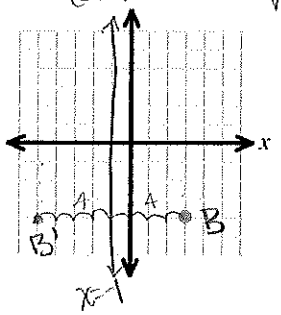


$4^2 + 7^2 = c^2$

$16 + 49 = c^2$

$\sqrt{65} = \sqrt{c^2}$ $c \approx 8.1$

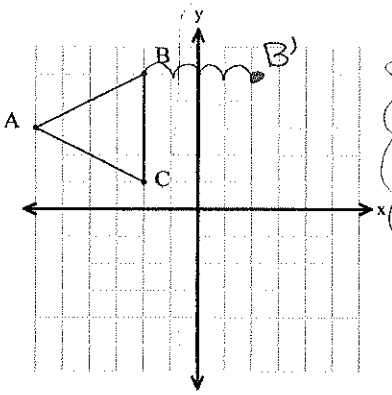
7. Find the coordinates of the image of the point $B(3, -4)$ when it is reflected across the line $x = -1$.



$B'(-5, -4)$

8. ΔABC is reflected across the y-axis. What are the coordinates of the image of B?

B'(2,5)



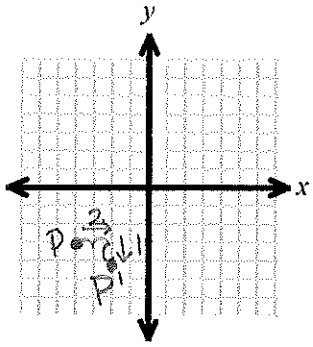
*I only reflected B because the question only requests the image of B, B'.

9. What is the image of point $P(-4,-3)$ after a translation along the vector $\langle 2,-1\rangle$?

right 2
down 1

<x, y> is a movement!

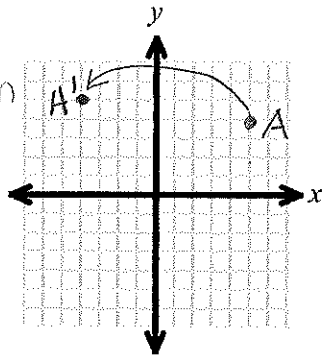
P'(-2,-4)



10. Given point A at $(5,4)$. If A is rotated 90 degrees counterclockwise about the origin, then what are the coordinates of A'?

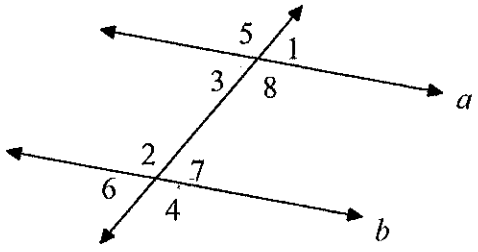
A'(-4,5)

*turn paper in the opposite direction of the angle of rotation.

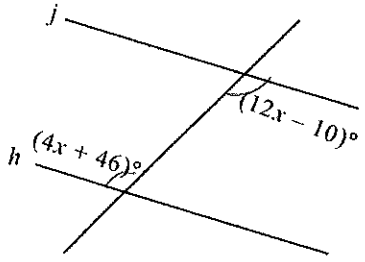


11. Given the diagram as shown, which statements below are true? **Select all that apply.**

A) ∠2 and ∠7 are alternate interior angles.
B) ∠3 and ∠6 are corresponding angles.
C) ∠8 and ∠7 are consecutive interior angles.
D) ∠3 and ∠7 are alternate interior angles.



12. Find the value of x if $j \parallel h$.



*alternate interior angles are ≅.

$4x + 46 = 12x - 10$
$-4x \quad -4x$
$46 = 8x - 10$
$+10 \quad +10$
$\frac{56}{8} = \frac{8x}{8}$

x = 7

13. Solve for x if $a \parallel b$.

*corresponding angles are ≅.

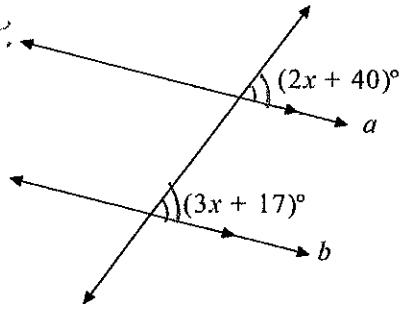
$2x+40 = 3x+17$

$-2x \quad -2x$

$40 = x+17$

$-17 \quad -17$

$\boxed{23 = x}$



14. Find $m\angle 1$ $m\angle 2$, and $m\angle 3$ in the diagram at the right.

① ΔsumThm

$47+33+?=180$

$80+?=180$

$-80 \quad -80$

$?=100°$

② Exterior ∠ Thm.

$\angle 1 = 47+100$

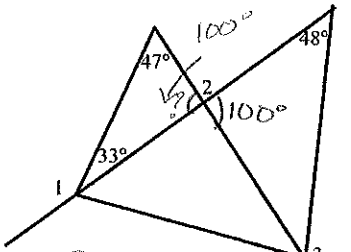
$\boxed{m\angle 1 = 147°}$

③ Ext. ∠ Thm

$\angle 2 = 33+47$

$\boxed{\angle 2 = 80°}$

④ vertical ∠s ≅.

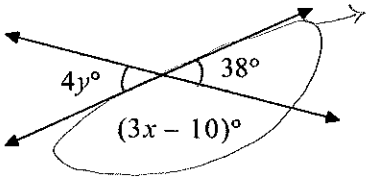


⑤ Ext. ∠ Thm

$\angle 3 = 100+48$

$\boxed{\angle 3 = 148°}$

15. Find x and y in the diagram shown.



① linear pair

$38+3x-10=180°$

$28+3x=180$

$-28 \quad -28$

$\frac{3x}{3} = \frac{152}{3}$

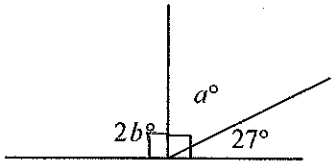
$\boxed{x = \frac{152}{3} \text{ or } 50.\overline{6}}$

② vertical ∠s ≅

$\frac{4y}{4} = \frac{38°}{4}$

$\boxed{y = \frac{19}{2} \text{ or } 9.5}$

16. Find a and b.



① rt. ∠

$a+27=90$

$-27 \quad -27$

$\boxed{a = 63°}$

② linear pair

$\frac{90}{2} = \frac{2b}{2}$

$\boxed{b = 45}$

17. Complete the syllogism below.

- If it snows on Thanksgiving, then Tony will build a snowman. ← H
- If Tony builds a snowman, then he will take pictures outside. ← C

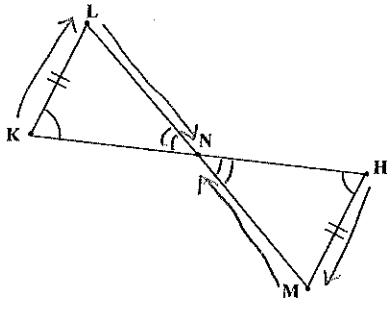
Conclusion: If it snows on Thanksgiving, then he will take pictures outside.

18. Given that $\Delta RGN \cong \Delta PQS$, then complete statements:

$\angle G \cong \angle Q$; $\overline{PQ} \cong \overline{RG}$; $\angle P \cong \angle R$

19. Refer to the figure to complete the congruence statement:

$\Delta KLN \cong \Delta HMN$.

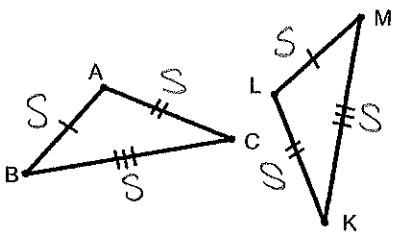


20. Which of the sets of sides below would NOT form a real triangle? **Select all that apply.**

A. 3, 3, 6 $3+3=6$
B. 5, 5, 9 $5+5>9$
C. 7, 7, 7 $7+7>7$
D. 2, 8, 13 $2+8<13$

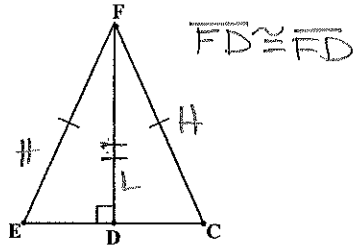
21. What postulate or theorem could be used to prove that the triangles shown are congruent?

A. SSS
B. SAS
C. ASA
D. AAS
E. HL



22. What postulate or theorem could be used to prove that the triangles shown are congruent?

A. SSS
B. SAS
C. ASA
D. AAS
E. HL



23. Write the equation of the line, in (h, k) form, that is perpendicular to $y = 3(x - 2) + 1$ and passes through $(-5, 4)$.

h k $m = -\frac{1}{3}$

$y = -\frac{1}{3}(x+5)+4$

h has a sign change

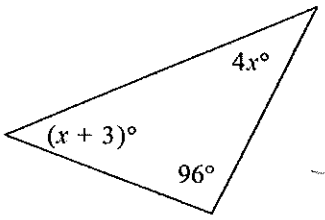
24. Write the equation of the line, in (h, k) form, that is parallel to $y = \frac{1}{6}(x + 4) - 2$ and passes through $(-5, 8)$.

h k $m = \frac{1}{6}$

$y = \frac{1}{6}(x+5)+8$

h has a sign change

25. Find x.



$4x+96+x+3=180°$

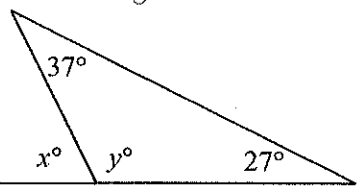
$5x+99=180$

$-99 \quad -99$

$\frac{5x}{5}=\frac{81}{5}$

$x = 16.2 \text{ or } \frac{81}{5}$

26. Find x and y.



$37+27+y=180°$

$64+y=180°$

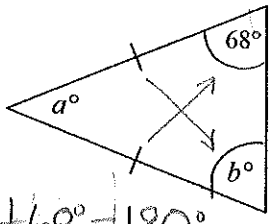
$-64 \quad -64$

$y = 116$

$x = 37+27$

$x = 64°$

27. Find a and b in the triangle shown.



$b = 68°$

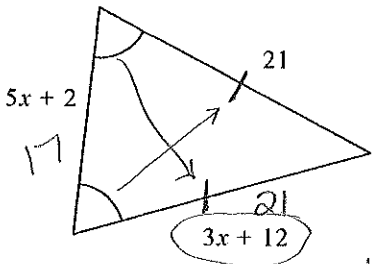
$a+68+68=180°$

$a+136=180°$

$-136 \quad -136$

$a = 44$

28. Find x in the triangle to the right.



$21=3x+17$

$-12 \quad -12$

$\frac{9}{3}=\frac{3x}{3}$

$x = 3$

* congruent sides are = to each other

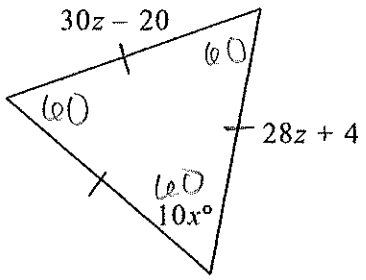
29. Find the perimeter of the triangle from #28.

$5(3)+2=17$

$17+21+21=P$

$P = 59$

For #30 – 31: use the equilateral triangle shown to the right. 3 sides ≅



30) Find x.

$60 = 10x$

$\frac{60}{10} = \frac{10x}{10}$

$x = 6$

31) Find z.

$30z - 20 = 28z + 4$

$-28z \quad -28z$

$2z - 20 = 4$

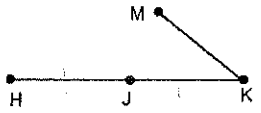
$+20 \quad +20$

$\frac{2z}{2} = \frac{24}{2}$ $z = 12$

32) Multiple Choice: What is the reason for Step 2?

Given: $\overline{KJ} \cong \overline{JH}$ KW S: ≅

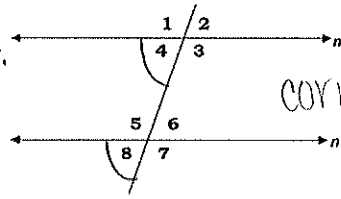
Prove: J is the midpoint of $\overline{HK}$. C: midpoint



1) $\overline{KJ} \cong \overline{JH}$	1) Given
2) J is the midpoint of $\overline{HK}$.	2) D

A) If a point is a midpoint, then it divides a segment into two congruent segments.
B) If two segments have the same length, then they are congruent.
C) If two segments are congruent, then they have the same length.
D) If a point divides a segment into two congruent segments, then it is a midpoint.

For #33 – 35: Complete the proof. Use the choices below.



relationship: corresponding ∠s

Given: $m \parallel n$
Prove: $\angle 4 \cong \angle 8$

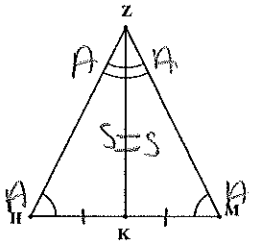
KW S: // C: ≅

Statement	Reason
1. #33 B	1. #34 A
2. $\angle 4 \cong \angle 8$	2. #35 D

Options for #33 – 35: Select the correct statement or reason. Not all options will be used. Write the letter of your answer in proof above.

A) Given B) $m \parallel n$ C) $\angle 4 \cong \angle 8$
D) If lines are parallel, then corresponding angles are congruent.
E) If lines are parallel, then alternate interior angles are congruent.
F) If lines are parallel, then consecutive interior angles are supplementary.
G) If corresponding angles are congruent, then lines are parallel.
H) If alternate interior angles are congruent, then lines are parallel.
I) If consecutive interior angles are supplementary, then lines are parallel.

For #36 – 38: Complete the proof. Use the choices below.



Given: $\angle HZK \cong \angle MZK$; $\angle H \cong \angle M$
Prove: $\overline{HK} \cong \overline{MK}$

Statement	Reason
1) $\angle HZK \cong \angle MZK$; $\angle H \cong \angle M$	1) Given
2) $\overline{ZK} \cong \overline{ZK}$	2) **#36)** (C) Reflexive Property
3) $\Delta HKZ \cong \Delta MKZ$	3) **#37)** (D) AAS
4) $\overline{HK} \cong \overline{MK}$	4) **#38)** (F) CPCTC

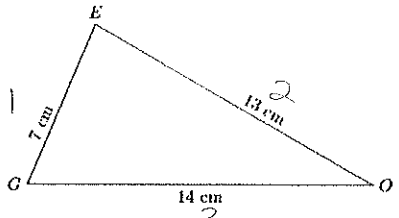
36) Multiple Choice: Select the correct reason.
A) If lines are perpendicular, then right angles are formed.
B) If a point is a midpoint, then the segment is divided into two congruent segments.
(C) Reflexive Property
D) Substitution Property

37) Multiple Choice: Select the correct reason.
A) SSS B) SAS C) ASA
(D) AAS E) HL F) CPCTC

38) Multiple Choice: Select the correct reason.
A) SSS B) SAS C) ASA
D) AAS E) HL (F) CPCTC

39) For the triangle to the right, list the angles from least to greatest.

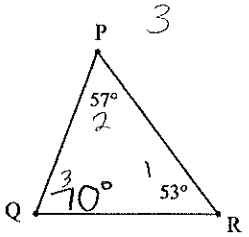
∠O, ∠G, ∠E



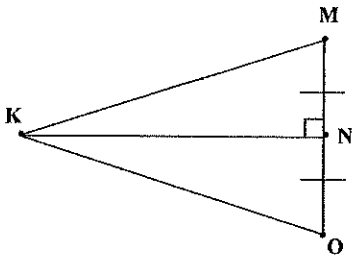
40) For the triangle to the right, list the sides from least to greatest.

$57+53+\angle Q = 180°$
$\angle Q = 70°$

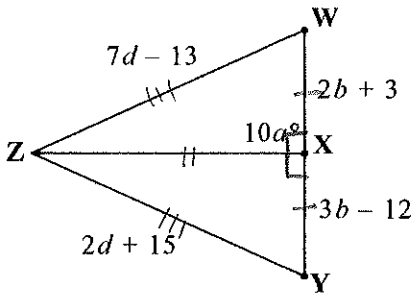
$\overline{QP}, \overline{QR}, \overline{PR}$



41) Complete the statement for the shape below: KN is the perpendicular bisector of MO.



For #42 – 44, use the diagram shown, where $\overline{ZX}$ is the perpendicular bisector of $\overline{WY}$.



42) Find a.

$10a = 90$ $\boxed{a = 9}$

43) Find b.

$2b + 3 = 3b - 12$
$-2b \quad -2b$
$3 = b - 12$
$+12 \quad +12$
$15 = b$

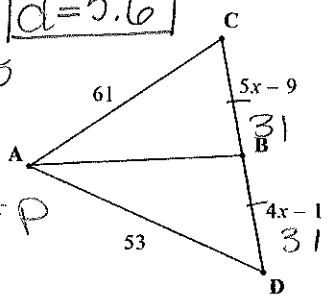
$\boxed{b = 15}$

44) Find d.

$7d - 13 = 2d + 15$
$-2d \quad -2d$
$5d - 13 = 15$
$+13 \quad +13$
$5d = 28$

$\boxed{d = 5.6}$

45) Find the perimeter of ΔACD if $\overline{AB}$ is a median.



$5x - 9 = 4x - 1$
$-4x \quad -4x$
$x - 9 = -1$
$+9 \quad +9$
$\boxed{x = 8}$

$CB = 5(8) - 9 = 31$

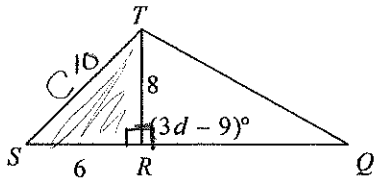
$61 + 31 + 31 + 53 = P$

$\boxed{P = 176}$

For #46 – 48: Find the requested values if $\overline{TR}$ is an altitude.

46) Find TS.

$6^2 + 8^2 = c^2$
$36 + 64 = c^2$
$\sqrt{c^2} = \sqrt{100}$
$c = 10 \rightarrow \boxed{TS = 10}$



47) Find d.

$3d - 9 = 90°$
$+9 \quad +9$
$3d = 99$

$\boxed{d = 33}$

48) Find the area of ΔRST.

$\frac{6 \times 8}{2} = \frac{48}{2} = \boxed{24}$

49) Segment $\overline{PQ}$ is drawn from the vertex of a triangle to the midpoint of the opposite side. What type of segment is $\overline{PQ}$?

A) altitude (B) median C) midpoint D) perpendicular bisector

50) Segment $\overline{JK}$ is drawn from the vertex of a triangle perpendicular to the opposite side. What type of segment is $\overline{JK}$?

(A) altitude B) median C) midpoint D) perpendicular bisector